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HEPCARE EUROPE- A case study of a service innovation project aiming at improving the elimination of HCV in vulnerable populations in four European cities

Gordana Avramovic[a,b], Maeve Reilly[h], Walter Cullen[b], Juan Macías[f], Geoff McCombe[b], Tina McHugh[a], Cristiana Oprea[e], Alistair Story[c], Julian Surey[d], Caroline Sabin[c], Sandra Bivegete[g], Peter Vickerman[g], Josephine Walker[g], Zoe Ward[g], John S Lambert[a,b,*]

[a] Mater Misericordiae University Hospital, Ireland, 44 Eccles St, Dublin 7, Ireland
[b] University College Dublin, Ireland, Catherine Mc Auley Centre, 21 Nelson St, Ireland
[c] Find & Treat, University College London Hospital NHS Trust, UK & Collaborative Centre for Inclusion Health, UCL, 250 Euston Rd, London, UK
[d] Institute of Global Health, University College London, UK & Find & Treat, University College London Hospital NHS Trust, 406a, Mortimer Market Centre, London, UK
[e] Victor Babes Clinical Hospital for Infectious and Tropical Diseases, 281 Mihai Bravu avenue, 030303, sector 3, Bucharest, Romania
[f] Hospital Universitario de Valme, Unidad Clínica de Enfermedades Infecciosas y Microbiología, Hospital Virgen de Valme, Avenida Bellavista s/n 41014 Sevilla, Spain
[g] Population Health Sciences, University of Bristol, School of Social and Community Medicine Oakfield House, Oakfield Grove, Bristol, UK
[h] University of St Andrews, St Andrews KY16 9AJ, UK

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ABSTRACT

Objectives: Hepatitis C Virus (HCV) is a significant cause of chronic liver disease. Among at-risk populations, access to diagnosis and treatment is challenging. We describe an integrated model of care, Hepcare Europe, developed to address this challenge.
Methods: Using a case-study approach, we describe the cascade of care outcomes at all sites. Cost analyses estimated the cost per person screened and linked to care.
Results: A total of 2608 participants were recruited across 218 clinical sites. HCV antibody test results were obtained for 2568(98•5%); 1074(41•8%) were antibody-positive, 687(60•5%) tested positive for HCV-RNA, 650(60•5%) were linked to care, and 319(43•5%) started treatment. 196(61•4%) of treatment initiates achieved a Sustained Viral Response (SVR) at dataset closure, 108(33•9%) were still on treatment, eight (2•7%) defaulted from treatment, and seven (2•6%) had virologic failure or died. The cost per person screened varied from €194 to €635, while the cost per person linked to care varied from €364 to €2035.
Conclusions: Hepcare enhanced access to HCV treatment and cure, and costs were affordable in all settings, offering a framework for scale-up and reproducibility.

Background

The number of people with chronic Hepatitis C Virus (HCV) infection in the European Union/European Economic Area (EU/EEA) region is estimated to be 5.6 million (European Centre for Disease Prevention and C, 2016). Chronic HCV infection can remain asymptomatic, leaving people unaware of their status. In the EU, 63·3% of all HCV infections are undiagnosed, with considerable variation between countries (Razavi et al., 2017). The HCV care cascade has numerous stages, from screening to cure. Historically, attrition from each stage of the cascade was high, with 5·9% of those testing HCV antibody-positive achieving cure pre-DAA availability (Simmons et al., 2018). In Ireland, our pilot study among the homeless, designed based on a systematic review (Lazarus et al., 2014), showed that out of 597 patients, 199 were antibody positive, and only two completed HCV treatment, demonstrating the need for alternative models of care (Lambert et al., 2019). Recently (Anon, 2020a), WHO (World Health Organization) stated that better HCV models of care are needed to retain patients along the care cascade. An efficient health system must deliver essential HCV treatment services to different populations and settings, reinforce strategic linkages between different health services, ensure quality and engage communities.

* Corresponding author at: Catherine Mc Auley Education & Research Centre, 21 Nelson St, Dublin 7, Ireland.
E-mail address: jlambert@mater.ie (J.S. Lambert).

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The HepCare Europe project sought to improve care systems for vulnerable HCV infected populations, assisting progress towards HCV elimination in line with WHO recommendations (Swan et al., 2018) and the EU HCV Manifesto (Anon, 2020b). In light of new technological and medical breakthroughs, we endeavored to improve outcomes at each stage of the care cascade by implementing interventions at four sites, London, Bucharest, Seville, Dublin (Swan et al., 2018), performing economic analyses to determine whether interventions were a value for the money.

Methods

Study design

A service innovation project and a mixed-methods, pre-post intervention study, Hepcare has

designed and delivered interventions in Dublin, London, Seville, and Bucharest to enhance People Who Inject Drugs (PWID) engagement and retention in the HCV care cascade. The study started in May 2016 and ended in August 2019 at all sites. We are presenting a case study of this integrated system of care for vulnerable populations (Swan et al., 2018). A description of the model of care is shown in Fig. 1. The same model was applied at each site. Each hospital targeted community organizations in their catchment area for outreach. Community organizations, therefore, varied from city to city. PWID were targeted for intensified HCV screenings (HEPCHECK) (Swan et al., 2018; Cha et al., 2013), linked to care (HEPLINK)(McCombe et al., 2018) and supported to remain engaged with the cascade of care using peer support (HEPFRIEND) (McCombe et al., 2019). HEPED developed and delivered educational interventions to prepare affected communities for HCV testing, assessment, and treatment and prepare healthcare providers to act as partners in a shared care primary/secondary partnership to treat HCV (McCombe et al., 2019). HEPCOST evaluated the cost of the various Hepcare interventions in different settings.

Quantitative data on the cascade of care and costs of the different initiatives were collected. In Dublin, London, and Bucharest, healthcare providers collected intervention costs; costs were not available from the Seville intervention due to staffing limitations (Anon, 2020c). Cost analyses were undertaken using top-down and ingredients-based approaches, depending on the information available at each site. The most up-to-date costs for all resources used were collected, and all retrospective costs were inflated to 2018 Euros using the Consumer Price Index for health. Country-specific prices were converted to a standard price index by adjusting for GDP differences using the purchasing power parity value for 2018 (Anon, 2020d). Financial and economic costs were collected and classified as capital (one-off costs) or recurrent (staff and test costs). Data collected for project activities included intervention set-up, non-research intervention activities, and staff usage. Expenditure costs were recorded. Research-related costs were excluded. Costs for capital items were annualized over five years with computer equipment costs annualized over two years. The outcomes of cost per patient screened, diagnosed with an infection, or linked to care was estimated by dividing the total cost by the number of individuals in each category. The cost per person treated was not estimated because treatment rates were affected by differences in regulatory barriers across settings, restricting some patients from obtaining treatment.

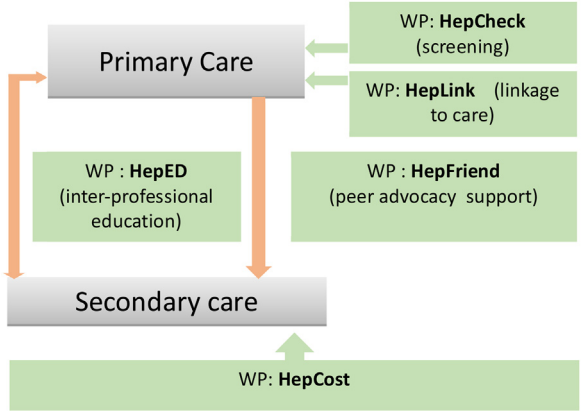

Fig. 1. The HepCare European System.

Settings and recruitment

The study was conducted across four European cities: Dublin, Cork(Ireland), London(UK), Seville(Spain), and Bucharest(Romania), and targeted high-risk populations. Recruitment was carried out by each city hospital in its surrounding community settings through outreach in community addiction, prison, homeless services, and GP practices prescribing methadone (Anon, 2020e).

Results

Networks created

The types and numbers of services that participated in the Hepcare outreach initiative varied from city to city. Table 1 presents types of clinical services that participated in the project, with outreach being undertaken across 218 services in four European cities, including homeless services, addiction services, and prisons. More community sites were reached in London due to the use of a mobile health unit. Seville mostly targeted drug treatment centers and NGOs, whereas Dublin mainly targeted prison and GP practices. Bucharest targeted night shelters and community organizations. Across the European sites, homeless services represent 49·1%, and drug addiction centers represent 34·9% of the services reached.

Type of testing

The rapid oral swab test was the most popular antibody testing method (50·1%, n = 1291). In Ireland, phlebotomy was used as a first testing option among prisoners due to an ethical ruling.

Cascade of care

The cascade of care results and their breakdown by site are shown in Table 2. Overall, 2608 participants were recruited across the four European countries, with 2568(98•5%) participants receiving an HCV antibody test. Of these, 1074(41•8%) had an HCV antibody positive result, and 687 (60•5%) were HCV-RNA positive. Overall, 650(64•0%) were then linked to care, and 319 (43•5%) started treatment. At dataset closure (Jul 31, 2019), 196 (61•4%) of the participants that started treatment had achieved SVR, 108(33•9%) were still on treatment, and twelve (4%) had other treatment outcomes. The rates of HCV antibody-positive participants linked to care in each country varied depending on the system used. For some sites, RNA testing was offered in the community, whereas other sites could only undertake RNA testing after linkage to care in hospitals. Ireland had the highest proportion of participants linked to care that subsequently started treatment n = 104 (64.2%). The effectiveness of HCV DAA treatment is verified in our study with 196(96•5%) individuals achieving SVR of the 203 that completed treatment; Romania had a higher percentage of virological failures (10%).

Table 1
Types of clinical service that were outreached to by site.

	Bucharest Romania	Dublin/Cork Ireland	Seville Spain	London UK	Total
Homeless Services	0 (0%)	2 (1%)	0 (0%)	105 (48%)	107 (49%)
Drug Addiction Centre	3 (1%)	1 (0–5%)	8 (4%)	64 (29%)	76 (35%)
General Practice (HepLink site)	0 (0%)	14 (6%)	3 (1%)	2 (1%)	19 (9%)
Prison	2 (1%)	1 (0–5%)	0 (0%)	0 (0%)	3 (1%)
Night Shelter	3 (1%)	0 (0%)	0 (0%)	0 (0%)	3 (1%)
Needle Exchanges	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
NGO	2 (1%)	0 (0%)	5 (2%)	0 (0%)	7 (3%)
Other (healthcare facilities, home visits, ED[a] LTFU case finding project (VIRAEMIC))	1 (0.5%)	0 (0%)	0 (0%)	2 (1%)	3 (1%)
Total (% of all orgs.)	11 (5%)	18 (8%)	16 (7%)	173 (79%)	218 (100%)

[a] *ED emergency department.*

Table 2
Cascade of Care Results by country.

	Romania	Ireland	Spain	England	Total
Individuals recruited	525	812	636	635	2608
Participants antibody test results recorded	525 (100%)	772 (95–9%)	636 (100%)	635 (100%)	2568 (98.5%)
HCV Ab positive results	230 (43·8%)	257 (33·0 %)	197 (31·0 %)	390 (61·4%)	1074 (41·8%)
RNA positive HCV infections[a]	71 (30·9%)	162 (63·0%)	108 (54·8%)	346 (88·7%)	687 (60·5%)
Participants linked to care[a]	151 (65·6%)	176 (68·5%)	104 (52·8%)	219 (56·1%)	650 (64%)
Participants put on Treatment	24 (33·8%)	104 (64·2%)	76 (70·4%)	115 (33·2%)	319 (43·5%)
Still on treatment results pending	4 (16·7%)	44 (42·3%)	20 (26·3%)	40 (34·8%)	108 (33·9%)
Completed treatment (including virologic failure and death)	20 (83·3%)	58 (55·7%)	54 (71·0%)	71 (61·7%)	203 (67·9%)
Abandon treatment	0 (0%)	2 (2%)	2 (2·6%)	4 (3·5%)	8 (2·7%)
Achieved SVR vs put on treatment	18 (75%)	57 (54·8%)	52 (68·4%)	69 (60%)	196 (61·4%)
Achieved SVR vs completed treatment	18 (90%)	57 (98·3%)	52 (96·3%)	69 (97·2%)	196 (96·5%)
Virologic failures vs completed treatment	2 (10%)	1 (1·7%)	2 (3·7%)	0 (0%)	5 (2·5%)
Death during treatment	0	0	0	2 (2·8%)	2 (0·1%)

[a] depending on the setting it was not always possibile to test for those RNA positive at community sites. Some sites could only accommodate oral POCT in which case patients were first linked to care and then phlebotomy was performed for the RNA testing. Other sites had the capacity to do phlebotomy on those who were antibody positive and the linkage to care was done later. So the percentages were calculated in relation to those who tested antibody positive. the OST prescribing GP practices in Ireland had to refer all Antibody positive patients to the hospital for RNA testing. Romania had to send all Antibody positive patients to the hospital for RNA testing.

Economic analysis

Table 3 presents the total costs of the main HepCare interventions in Dublin, Bucharest, and London. These costs do not include the costs of treatment or treatment workup. The London outreach intervention was most expensive (£97,472 or €112,093), with active case finding in a mobile van. Next was the prison mass-screening intervention in Dublin (€81,505), the intervention in OST GP practices in Dublin (€64,806), and multiple interventions in Bucharest (€56,647). Dublin's main cost components were overheads, primarily due to the inclusion of management staff time during implementation.

In contrast, salary costs for undertaking screening were the most expensive component in London (58% of total costs), while in Bucharest, the highest costs were for training (23%) and peer support (23%). The high London salary cost for screening is related to having an HCV specialist nurse, peer, and driver for the mobile intervention van. In contrast, salary costs for screening in Bucharest were less costly (7%) than in other settings.

Table 4 compares the costs per outcome for each setting. These outcomes differ from what is presented in Table 2 because the cost analysis only evaluated two Dublin interventions and one in London. Additionally, the London intervention was priced over one financial year (2017/18), and so patient outcomes were taken from that period. The cost per person screened varies 3-times across settings after adjustment to 2018 Irish Euros, with the two Dublin interventions having the lowest (prison screening €194) and highest (OST screening €635) unit cost. The high cost of screening in the OST clinic in Dublin is due to the small number of patients

Table 3
Total costs (in 2018 euro or pounds) across settings and allocated by cost category (overheads/equipment, test cost, fibroscan, training, staff screening and peer support).

Cost Category	Bucharest (varied interventions[b])		Dublin (OST)		Dublin (prison)		London[c](Outreach)	
	Total Cost	%	Total Cost	%	Total Cost	%	Total Cost	%
Overheads/ Equipment	€7905	14	€38,564	60	€33,400	41	[a]	[a]
Test cost (Ab/RNA)	€9977	18	€4064	6	€9802	12	£5047	5
Fibroscan	€8827	16	€2045	3	€799	1	£15,142	15
Training	€12,704	23	€6823	11	€2374	3	0	0
Salary costs for screening	€4615	7	€12,134	19	€25,206	31	£56,086	58
Peer support	€12,619	22	€1176	2	€9924	12	£21,197	22
Total Cost	€56,647		€64,806		€81,505		£97,472	

[a] Overheads in London were not separated out, instead overheads were shared across the care cascade.
[b] Includes interventions in homeless shelters, addiction services, prisons, through NGO and in infectious disease wards. The test cost category (Ab/RNA) denotes Ab screening for London and Bucharest, whereas Dublin(OST) and Dublin (Prison) tested for RNA.
[c] London costs are presented for one year only, rather than the full intervention period.

Table 4
Comparison of costs (in euros) per patient screened, diagnosed or linked to care by intervention setting.

Intervention	Screened			Diagnosed			Linked to care		
	Number	Actual unit cost	PPS adjusted unit cost	Number	Actual unit cost	PPS adjusted unit cost	Number	Actual Unit cost	PPS adjusted unit cost
Dublin(OST)(€)	102	€635	€635	57	€1137	€1137	43	€1507	€1507
London (£)	273	£248*	€$_{pps}$513	121	£558*	€$_{pps}$1154	110	£1171*	€$_{pps}$2421
Dublin(Prison) (€)	419	€194	€194	50	€1628	€1628	40	€2035	€2035
Bucharest(€)	525	€107	€$_{pps}$313	230	€244	€$_{pps}$713	154	€364	€$_{pps}$1064
Bucharest (Shelter)	163	€73	€213	9	€1326	€3874	4	€2983	€8716
Bucharest(OST)	70	€151	€441	59	€180	€526	25	€424	€1239
Bucharest(Prison)	153	€106	€310	57	€285	€833	43	€378	€1104
Bucharest (NGO)	56	€94	€274	30	€176	€514	17	€311	€909
Bucharest(ID Wards)	83	€152	€444	75	€168	€491	65	€194	€567

Actual country specific costs are included, as well as adjusted costs transformed to the Irish euro GDP value of 2018. GBP converted to EUR at 1.15 EUR/GBP. Costs for Bucharest and London then adjusted to Irish Euros using purchasing power standard ratios, with 1.87 for Ireland, 1.04 for London, and 0.64 for Bucharest.

screened. Unit costs increase 2–10 times for the cost per person linked to care, reflecting that only a proportion of people tested are infected, which varies by setting, and not all those infected are linked to care. Although the prison intervention in Dublin has the lowest unit cost for screening, it has the highest unit cost per person diagnosed due to the low proportion of HCV infected patients (12% were RNA+). The cost per person linked to care for the London outreach intervention is higher than the cost per person diagnosed, due to the cost of using peer support to facilitate patient attendance in secondary care.

Discussion

HepCare accessed a high number of vulnerable patients in all four cities through joining up and improving services. Although it was thought that oral swabs were the best testing method for the project, in practice, a key part of the system's success relied on flexibility in the testing methods to engage community partners.

Despite significant successes, the HepCare system's effectiveness was limited because of social, regulatory, and medical reasons, as well as the capacity to access certain populations. Bucharest faced medical and regulatory barriers, which meant they could only treat 24(33•8%) of their 71 diagnosed HCV RNA + participants. Until 2018, DAA treatment was only available for advanced liver fibrosis (Metavir F3 and F4 score) in Romania, so most patients from Bucharest with lower fibrosis stages were not eligible for reimbursed investigations and treatment by the national insurance system. Also, some patients may not have been treated with suitable DAA regimens because genotype testing was unavailable for PWID in Bucharest, contributing to the two reported virologic failures (10% of HepCare Bucharest). Most importantly, the Romanian National Insurance scheme requires an individual to have an identity card, a health-card, and insurance before accessing HCV diagnostics and treatment. This presented a significant barrier because 143 HCV antibody-positive prisoners were neither tested for HCV-RNA nor treated because they did not fulfill these criteria. In Dublin, the limited healthcare budget and high cost of DAA regimens restricted availability of treatment, from July 2017 to February 2018 with a freeze of new treatments imposed by the government. This significantly disrupted the HepCare 'cascade of care' among targeted vulnerable populations where timeliness is key to keeping patients engaged in care. Hepcare Seville could not access two key populations, prisoners and immigrants. In London, some key populations such as the Roma traveler communities, and sex workers, were hard to reach with existing peers. Finally, our cost analysis implicates the affordability of the interventions, although a comparison of the costs per outcome reached at each point in the care cascade reveals wide variations between settings due to differences in HCV prevalence, availability of confirmatory testing, and barriers to linkage to care.

Hepatitis C care has undergone tremendous changes due to technological advances, including non-invasive rapid tests (e.g., Oraquick® and Fibroscan technology)(Anon, 2020f; Pallarés et al., 2018; Sebastiani et al., 2014) and DAA treatments (Schlabe and Rockstroh, 2018). This has enabled new possibilities and the rapid expansion of systems of care for HCV. The Hepatitis C Assessment and Testing (HepCAT) project in New York, a prospective cross-sectional project conducted in three primary care clinics in low economic activity areas (Drainoni et al., 2012), increased both numbers screened and diagnosed. It increased HCV diagnosis and linkage to care but did not report subjects achieving SVR. Conversely, HepCATT (Hepatitis C Awareness Through to Treatment), UK, had two branches recruiting from primary care and drug treatment services (Roberts et al., 2016; Harrison et al., 2019). The HepCATT drug treatment service study was a nurse-led intervention to increase case-finding and linkage to care, utilizing 'buddies' and peers. Compared with baseline and control districts, there was strong evidence that HCV testing and engagement with HCV therapy increased substantially. An economic evaluation of the intervention showed comparable costs for screening and engagement as found for HepCare, with costs per person screened (reflex testing of dried blood spots) ranging from £106-£207 (management costs not included) (Anon, 2020g). Other work in Tayside (Scotland) (Dillon, 2018) has created a new pathway that allows a pharmacist to undertake HCV testing, prescribe medicine, and observe patients taking medication (Andrew et al., 2020). This Scottish model was also applied in Opioid Substitution Therapy (OST) clinics and Needle and Syringe Exchange Programmes (NSP). This model is at the forefront of new systems of care that devolve HCV care to the community. It is not yet easily adaptable to other settings because pharmacists have no legal authority to undertake such services. Compared to results before HepCare (McCombe et al., 2018; Anon, 2020e), the system improved outcomes. Costs of the HepCare interventions compare favorably with the range of costs per case detected (£245−3107) from a systematic review of economic evaluations of screening for HCV (Anon, 2020h) and the costs from more recent intervention evaluations (£100 to £318 per person screened) (Schackman et al., 2018; Ward et al., 2020; Radley et al., 2017).

Devolution of HCV care to the community effectively reaches vulnerable populations, but cannot supply the specialty care needed for complex cases including cirrhotics. HepCare is the blueprint model that can be used across a range of healthcare systems and community settings for micro-elimination of HCV. Focusing on one disease may be a weakness, although those

engaged in HepCare may be more likely to access other health services in the future. Projects such as INTEGRATE (Anon, 2020i) are focussing on integrating various diseases.

Strengths of cost analysis include collecting empirical cost data from numerous interventions in three countries, aiding generalisability of findings to other European settings. However, limitations include being unable to undertake a cost analysis in Spain, which used a nurse-led model similar to London, but without a mobile unit. The costing methods used in different countries were also slightly different to make the best use of available information. While this means the results may be less comparable, it reflects the nature of the populations being screened and the different approaches needed in each. The variation in costs across settings is due to differences in the interventions undertaken and local differences affecting the investment needed in staff time versus materials. The cost analyses did not include the cost of treatment or related visits and diagnostics because the focus was on the costs of screening and linkage to care; also, treatment rates were affected by local regulatory restrictions. At the time, all treatments (except in the Dublin prison) were done in hospitals, meaning that the treatment costs should be similar in each setting regardless of the screening and linkage to care intervention. This will change as treatment moves to the community. We also did not undertake a full cost-effectiveness analysis because this is the focus of separate analyses – here we compared the differences in unit costs of the interventions across settings, which is useful information for other settings planning the resource needs for undertaking similar interventions. Finally, these were pilot interventions in which we were unable to assess the resources needed to scale them up to the broader population. As interventions scale-up, there will be cost savings from reduced managerial or training costs. Also, over time, prevalence is likely to change, with high rates of treatment leading to a reduced prevalence, and therefore the cost per diagnosis may increase unless screening becomes more targeted. In high incidence populations such as PWID, this change is likely to be slower due to re-infections.

HepCare has impacted on policy and practice. In Dublin, the project developed an advocacy document (HEPMAP) disseminated to the Irish Health Service Executive. In Bucharest, recommendations were sent to the National Infectious Diseases Committee and Director of the National Programmes in the Ministry of Health. HepCare successfully changed HCV treatment policies toward at-risk populations by promoting the recent removal of disease-based and laboratory restrictions, permitting the treatment of all patients (September 2018). In Seville, the HepCare model was replicated at other tertiary care centers in eight Andalusian provinces. Outside Andalusia, centers in Valencia and Galicia are planning to implement the model. In London, the HepCare mobile outreach model of care has inspired other services, including the Hepatitis C Trust, which is launching a similar mobile screening service with the NHS in southern England to directly access hard-to-reach patients based on the HepCare model. St Mungo's, the largest provider of homeless accommodation in London, now has regular screening programs due to the partnership.

The cost analysis has revealed that numerous different interventions can be affordable across Europe. One important lesson is that the yield of testing is a significant indicator of costs, varying unexpectedly across testing settings. In Bucharest, high HCV prevalence was expected in homeless shelters, but this was not the case. Perhaps pilot screening measures in proposed high-risk groups could be used to make more informed judgments of the best way to target initiatives. Otherwise, staff costs varied and were large in some settings. Interventions could be made more efficient by optimizing these costs. Incorporating screening into existing services will be more efficient than setting up entirely new interventions.

Conclusion

This first multi-city study offers a framework for scale-up and reproducibility for achieving HCV elimination goals. However, vulnerable populations have numerous health conditions, highlighting the importance of integrating multiple health needs as initiatives are expanded. To achieve HCV elimination and other targets of the Sustainable Development Goals (SDG) 2030 agenda, it is imperative to reach vulnerable populations not accessing care and leave no one behind.

Transparency declaration

JL has received non-restricted grants from Gilead, Abbvie, and MSD for Hepatitis C related educational and research activities. JL has received honorariums for advisory board meetings on HIV and HCV, organized by Gilead, Abbvie, Glaxo Smith Kline, Viiv, and Merck. WC has been a principal investigator on research projects funded by the Health Research Board of Ireland, the European Commission Third Health Program, and Ireland's Health Services Executive. WC has also been a co-investigator on projects funded by Gilead and Abbvie. JM has served as an investigator in clinical trials supported by Bristol-Myers-Squibb, Gilead, and MSD. JM has also served as a paid lecturer for Gilead, Bristol-Myers-Squibb, and MSD, and has received consultancy fees from Bristol-Myers-Squibb, Gilead, and MSD. JM has received a grant from the Servicio Andaluz de Salud de la Junta de Andalucia. CO has served as a paid speaker for Janssen, BMS, and Abbvie, has served as an advisory board member for Teva, ViiV, and Gilead, and as a principal investigator on clinical trials supported by ViiV, and as a co-investigator on clinical trials supported by Abbvie and Tibot. PV has received unrestricted research grants from Gilead and honoraria from Gilead and Abbvie.

Authors' contributions

Gordana Avramovic- Review of the pilot project, study design, figures, data collection, data analysis, data interpretation, manuscript writing. Maeve Reilly -Data analysis, manuscript writing. Walter Cullen- Literature search, review of the pilot project, study design, data collection, data analysis, manuscript review. Juan Macías- Study design, data collection, data analysis, data interpretation, manuscript review. Geoff McCombe - Literature search, data collection, manuscript review. Tina McHugh- Data collection, data analysis, manuscript review. Cristiana Oprea- Study design, data collection, data analysis, data interpretation, manuscript review. Alistair Story- Study design, data collection, data analysis, data interpretation, manuscript review. Julian Surey- Study design, data collection, data analysis, data interpretation, manuscript review. Sandra Bivegete- Data collection, data analysis, manuscript writing. Peter Vickerman- Study design, data collection, data analysis, data interpretation, manuscript writing. Josephine Walker- Data collection, data analysis, manuscript writing. Zoe Ward- Data collection, figures, data analysis, manuscript writing. John S Lambert- Literature review, pilot project review, study design, data analysis, data interpretation, manuscript review. All authors have approved the final version for publication and are accountable for all aspects of the work.

Ethics committee approval

Ethical approval was granted by the Institutional Review Boards in each of the sites, namely: Mater Misericordiae University

Hospital (Dublin, Ireland); North-West Haydock Research Ethics Committee (London, UK); Hospital Universitario de Valme (Seville, Spain); and Victor Babes Clinical Hospital for Infectious and Tropical Diseases (Bucharest, Romania). Governance and oversight for the study were provided through the overall governance structure of the HepCare Europe Project.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijid.2020.09.1445.

References

European Centre for Disease Prevention and C. Systematic Review on Hepatitis B and C prevalence in the EU/EEA. ECDC Stockholm; 2016.
Razavi H, Robbins S, Zeuzem S, et al. Hepatitis C virus prevalence and level of intervention required to achieve the WHO targets for elimination in the European Union by 2030: a modeling study. Lancet Gastroenterol Hepatol 2017;2(5):325–36.
Simmons R, Ireland G, Irving W, et al. Establishing the cascade of care for hepatitis C in England-benchmarking to monitor the impact of direct-acting antivirals. J Viral Hepat 2018;25(5):482–90.
Lazarus JV, Sperle I, Maticic M, Wiessing L. A systematic review of Hepatitis C virus treatment uptake among people who inject drugs in the European Region. BMC Infect Dis 2014;14(Suppl 6)S16, doi:http://dx.doi.org/10.1186/1471-2334-14-S6-S16 Epub 2014 Sep 19. https://www.ncbi.nlm.nih.gov/pubmed/25252742 27/4/2020.
Lambert JS, Murtagh R, Menezes D, et al. 'HepCheck Dublin': An Intensified Hepatitis C Screening Programme in a Homeless Population Demonstrates the Need for Alternative Models of Care. BMC Infect Dis 2019;19(February (1)):128, doi:http://dx.doi.org/10.1186/s12879-019-3748-2.
https://www.who.int/hepatitis/strategy2016-2021/ghss-hep/en/23/04/2020.
http://www.hcvbrusselssummit.eu/elimination-manifesto23/4/2020.
Swan D, Cullen W, Macias J, et al. Hepcare Europe - bridging the gap in the treatment of hepatitis C: study protocol. Expert Rev Gastroenterol Hepatol 2018;12(March (3))303–14, doi:http://dx.doi.org/10.1080/17474124.2018.1424541 Epub 2018 Jan 16.
Cha YJ, Park Q, Kang ES, et al. Performance evaluation of the OraQuick hepatitis C virus rapid antibody test. Ann Lab Med 2013;33(3):184–9.
McCombe G, Swan D, O'Connor E, et al. Integrated Hepatitis C Care for People Who Inject Drugs (Heplink): Protocol for a Feasibility Study in Primary Care. JMIR Res Protoc 2018;7(6)e149, doi:http://dx.doi.org/10.2196/resprot.9043 PMID: 29866641 https://www.researchprotocols.org/2018/6/e149/ (last accessed 17 Sept 2020).
McCombe G, Almaazmi B, Cullen W, et al. Integrating primary and secondary care to optimize hepatitis C treatment: development and evaluation of a multidisciplinary educational Masterclass series. J Ant Chem 2019;74(November Suppl_5):v24–30. https://doi.org/10.1093/jac/dkz453.
https://stats.oecd.org/Index.aspx?DataSetCode=PRICES_CPI. 23/4/2020.
https://data.oecd.org/gdp/gross-domestic-product-gdp.htm 23/4/2020.
https://www.tandfonline.com/doi/full/10.1080/17474124.2018.1424541 23/4/2020.
http://www.orasure.com/products-infectious/products-infectious-oraquick-hcv.asp 23/4/2020.
Pallarés C, Carvalho-Gomes Â, Hontangas V, et al. Performance of the OraQuick Hepatitis C virus antibody test in oral fluid and fingerstick blood before and after treatment-induced viral clearance. J Clin Virol 2018;102(May)77–83, doi:http://dx.doi.org/10.1016/j.jcv.2018.02.016 Epub 2018 Feb 24.
Sebastiani G, Gkouvatsos K, Pantopoulos K. Chronic hepatitis C and liver fibrosis. World J Gastroenterol 2014;20(August (32)):11033–53, doi:http://dx.doi.org/10.3748/wjg.v20.i32.11033.
Schlabe S, Rockstroh JK. Advances in the treatment of HIV/HCV coinfection in adults. Expert Opin Pharmacother 2018;19(January (1)):49–64, doi:http://dx.doi.org/10.1080/14656566.2017.1419185.
Drainoni ML, Litwin AH, Smith BD, et al. Effectiveness of a Risk Screener in Identifying Hepatitis C Virus in a Primary Care Setting. Am J Public Health 2012;102(November (11))e115–21 PMID: 22994166.
Roberts K, Macleod J, Metcalfe C, et al. Hepatitis C–assessment to treatment trial (HepCATT) in primary care: study protocol for a cluster-randomized controlled trial. Trials 2016;17(1):366.
Harrison GI, Murray K, Gore R, et al. The Hepatitis C Awareness Through to Treatment (HepCATT) study: improving the cascade of care for hepatitis C virus-infected people who inject drugs in England. Addiction 2019;114(June (6))1113–22, doi:http://dx.doi.org/10.1111/add.14569 Epub 2019 Mar 12.
https://onlinelibrary.wiley.com/doi/full/10.1111/add.14978?af=R 23/4/2020.
Dillon J. Models of HCV screening & treatment: An evidence-based international perspective. In Hepatitis C Conference 2018 Hidden Disease: The Future of Hepatitis C Treatment in the Community and Primary Care in Ireland. Nelson Street, Dublin 7, Ireland: The Catherine McAuley Centre, Mater Hospital; 2018 D07 A8NN.
Andrew R, De Bruin M, Inglis SK, Donnan PT, Dillon JF. Clinical effectiveness of pharmacy-led versus conventionally delivered antiviral treatment for hepatitis C in patients receiving opioid substitution therapy: a study protocol for a pragmatic cluster randomized trial. Gastroenterol Hepatol 2020;. https://bmjopen.bmj.com/content/8/12/e02144323/4/2020.
https://bmjopen.bmj.com/content/6/9/e011821 23/4/2020.
Schackman BR, Gutkind S, Morgan JR, et al. Cost-effectiveness of hepatitis C screening and treatment linkage intervention in US methadone maintenance treatment programs. Drug Alcohol Depend 2018;185(April)411–20, doi:http://dx.doi.org/10.1016/j.drugalcdep.2017.11.031 Epub 2018 February 21.
Ward Z, Reynolds R, Campbell L, et al. Cost-effectiveness of the HepCATT intervention in specialist drug clinics to improve case-finding and engagement with HCV treatment for people who inject drugs in England. Addiction 2020;(January), doi:http://dx.doi.org/10.1111/add.14978.
Radley A, Tait J, Dillon J. DOT-C: A cluster randomised feasibility trial evaluating directly observed anti-HCV therapy in a population receiving opioid substitute therapy from community pharmacy. Int J Drug Policy 2017;47(September)126–36, doi:http://dx.doi.org/10.1016/j.drugpo.2017.05.042 Epub 2017 Jun 21.
https://integrateja.eu/ 23/4/2020.